PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Applicant	:	Gregory E. Tierney, et al.
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AMENDED APPEAL BRIEF

Sir:

In response to the Notice of Non-Compliant Appeal Brief dated February 21, 2008, Applicant's representative presents this Amended Appeal Brief.

I. TABLE OF CONTENTS

II. REAL PARTY IN INTEREST

The real party in interest is Hewlett-Packard Development Company, L.P., as indicated by the Assignment recorded January 20, 2004, Reel/Frame: 014919/0228.

III. RELATED APPEALS AND INTERFERENCES

The following is a list of application numbers for pending appeals that may be considered related to the subject appeal: 10/760,640, 10/760,599, 10/760,659, 10/760,813, and 10/761,073.

IV. STATUS OF CLAIMS

Claims 1-35 which are attached in Appendix A, are currently pending in this application. Claims 1-6, 8-9 and 13 stand rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent Pub. No. 2004/00029992 to Cypher ("Cypher") in view of U.S. Patent No. 6,922,756 to Hum ("Hum"). Claims 7, 10 and 31 stand rejected as being unpatentable over Cypher in view of Hum and in further view of U.S. Patent Pub. No. 2004/0123047 to Hum ("Hum 2"). Claims 11, 12, 14-15, 17-30 and 32-34 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Cypher in view of Hum and in further view of U.S. Patent No. 6,138,218 to Arimilli ("Arimilli"). Claims 16 and 22 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Cypher in view of Hum, in further view of Arimilli and in further view of Hum 2. Claim 35 has been objected to as being dependent from a rejected base claim, but would be allowable if

rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The rejection of claims 1-34 is appealed.

V. STATUS OF AMENDMENTS

A Final Office Action ("Final Action") was issued for the present application on March 13, 2007. No amendments were made to the claims after the Final Action. A pre-appeal conference request for review was filed in this case along with a notice of Appeal on May 4, 2007. A notice of a panel decision from a pre-appeal brief review was issued on July 2, 2007. The notice of the panel's decision indicated that the application remains under appeal because there is at least one actual issue for appeal.

VI. SUMMARY OF THE CLAIMED SUBJECT MATTER

A. Claim 1

One aspect of the present invention, as recited in claim 1, is directed to system (10 of FIG. 1) comprising a first node (12 of FIG. 1) operative to provide a source broadcast requesting data (Par. [0031], page 7, lines 10-16). The first node (12 of FIG. 1) associates an F-state with a copy of the data in response to receiving the copy of the data from memory (16 of FIG. 1) and receiving non-data responses from other nodes (14 and 20 of FIG. 1) in the system (10 of FIG. 1;

Par. [0032], page 7, line 17 to page 8, line 2). The non-data responses include an indication that at least a second node (14 of FIG. 1) includes a shared copy of the data (Par. [0032], page 7, line 17 to page 8, line 2). The F-state enables the first node (12 of FIG. 1) to serve as an ordering point in the system (10 of FIG. 1) capable of responding to requests from the other nodes (14 and 20 of FIG. 1) in the system (10 of FIG. 1) with a shared copy of the data (Par. [0033], page 8, lines 3-14).

B. Claim 2

Claim 2 is directed to the system (10 of FIG. 1) of claim 1, wherein the non-data responses further comprise an indication that the other nodes (14 and 20 of FIG. 1) in the system (10 of FIG. 1) do not have a copy of the data requested by the first node (12 of FIG. 1; Par. [0033], page 8, lines 3-14).

C. Claim 3

Claim 3 is directed to the system (10 of FIG. 1) of claim 1, wherein the source broadcast requesting the data comprises a non-ownership request for the data (Par. [0032], page 7, line 17 to page 8, line 2).

D. Claim 4

Claim 4 is directed to the system (10 of FIG. 1) of claim 3, wherein the non-ownership request comprises a source broadcast read request (Par. [0032], page 7, line 17 to page 8, line 2).

E. Claim 5

Claim 5 is directed to the system (10 of FIG. 1) of claim 1, wherein the first node (12 of FIG. 1) comprises a first processor (12 of FIG. 1) having an associated cache (22 of FIG. 1) that comprises plurality of cache lines, one of the cache lines having an address associated with the copy of data received from memory (16 of FIG. 1) and state data that defines the state of the data stored in the one of the cache lines (Par. [0024], page 5, lines 14-20).

F. Claim 6

Claim 6 is directed to the system (100 of FIG. 3) of claim 5, wherein the first processor (102 of FIG. 3) further comprises a cache controller (118 of FIG. 3) that controls the state of the data stored in the plurality of cache lines (116 of FIG. 3; Par. [0055], page 14, lines 9-17).

G. Claim 7

Claim 7 is directed to the system (10 of FIG. 1) of claim 6, wherein the cache controller is capable of silently evicting the data stored in the one of the cache lines by modifying the state information from the F-state to an invalid state for the data (Par. [0034], page 8, lines 15-21).

H. Claim 10

Claim 10 is directed to the system (10 of FIG. 1) of claim 9, wherein the cache controller further comprises a state engine capable of silently evicting data stored in a cache line having the F-state by modifying the state information for

the cache line from the F-state to an invalid state for the data (Par. [0034], page 8, lines 15-21).

I. Claim 11

Claim 11 is directed to the system (10 of FIG. 1) of claim 1, wherein the system (10 of FIG. 1) implements a source broadcast protocol to process requests and responses provided by nodes (14 and 20 of FIG. 1) within the system (10 of FIG. 1; Par. [0039], page 9, line 32 to page 10, line 6). The system (10 of FIG. 1) transfers to an associated forward progress protocol in response to a request failing in the source broadcast protocol (Par. [0041], page 10, lines 18-29).

J. Claim 12

Claim 12 is directed to the system (10 of FIG. 1) of claim 11, wherein the forward progress protocol comprises a directory-based protocol (Par. [0041], page 10, lines 18-29).

K. Claim 13

Claim 13 is directed to the system (10 of FIG. 1) of claim 1, wherein the ordering point defined by the F-state migrates from the first node (12 of FIG. 1) to another node (20 of FIG. 1) in response to the another node issuing a source broadcast non-ownership request for a copy of the data (Par. [0039], page 9, line 32 to page 10, line 6).

L. Claim 14

Another aspect of the invention, as recited in claim 14, is directed to a multiprocessor network (100 of FIG. 3) comprising a plurality of processor nodes (102, 104 and 106 of FIG. 3) in communication with each other (Par. [0050], page 13, lines 1-8). At least a first node (102 of FIG. 3) of the plurality of processor nodes (102, 104 and 106 of FIG. 3) includes a copy of data associated with a given address that is also shared with memory (110 of FIG. 3; Par. [0050], page 13, lines 1-8). The first node (102 of FIG. 3) operates in a first state that causes the first node (102 of FIG. 3) to respond to a non-ownership request from a second node of the plurality of processor nodes (102, 104 and 106 of FIG. 3) for the data by (i) sending a response to the second node (104 and 106 of FIG. 3) that includes a shared copy of the data, and (ii) transitioning from the first state to a second state indicating that the data is shared (Par. [0060], page 17, lines 15-27). The second node (104 and 106 of FIG. 3) transitions to a third state in response to receiving the shared copy of the data from the first node (102 of FIG. 3), such that the second node (104 and 106 of FIG. 3) becomes an ordering point in the network for providing a shared copy of the data (Par. [0060], page 17, lines 15-27).

M. Claim 15

Claim 15 is directed to the network (100 of FIG. 3) of claim 14, wherein each of the plurality of processor nodes (102, 104 and 106 of FIG. 3) further

comprises an associated cache (114 of FIG. 3) that comprises a plurality of cache lines (116 of FIG. 3; Par. [0053], page 13, lines 27-33). Each cache line (116 of FIG. 3) has a respective address that identifies associated data and state information that indicates the state of the associated data for the respective cache line (116 of FIG. 3; Par. [0053], page 13, lines 27-33).

N. Claim 16

Claim 16 is directed to the network (10 of FIG. 1) of claim 15, wherein a cache line in one of the first and second states being capable of silently evicting associated data by modifying the state information for the cache line to an invalid state (Par. [0034], page 8, lines 15-21).

O. Claim 19

The network (100 of FIG. 3) of claim 14, wherein the third state and the second state are the same.

P. Claim 20

Still another aspect of the invention, as recited in claim 20 is directed to a computer system (50 of FIG. 2), comprising a plurality of processors (54, 56, 58 and 60 of FIG. 2; Par. [0045], page 11, lines 26-31). The plurality of processors (54, 56, 58 and 60 of FIG. 2) includes a source processor (56 of FIG. 2) that issues a broadcast request for desired data while in a first state (Par. [0046], page 11, line 32 to page 12, line 3). The plurality of processors (54, 56, 58 and 60 of FIG. 2) also includes at least one target processor (54, 58 and 60 of FIG. 2)

having an associated cache (64, 68 and 70 of FIG. 2) that includes a shared copy of the desired data (Par. [0047], page 12, lines 4-15). The at least one target processor (54, 58 and 60 of FIG. 2) responding to the broadcast request with a response indicating that the at least one target processor (54, 58 and 60 of FIG. 2) includes the shared copy of the desired data (Par. [0047], page 12, lines 4-15). Memory (72 of FIG. 2) stores the desired data, and responds to the broadcast request with a response that includes a copy of the desired data (Par. [0047], page 12, lines 4-15). The source processor (56 of FIG. 2) transitions from the first state to a second state in response to receiving the responses from the memory (72 of FIG. 2) and the at least one target processor (54, 58 and 60 of FIG. 2; Par. [0047], page 12, lines 4-15). The second state enables the first processor (56 of FIG. 2) to respond to requests from other of the plurality of processors (54, 58 and 60 of FIG. 2) with a copy of the desired data (Par. [0047], page 12, lines 4-15).

Q. Claim 21

Claim 21 is directed to the system (50 of FIG. 2) of claim 20, further comprising at least one other processor (54, 58 and 60 of FIG. 2) having an associated cache (64, 68 and 70 of FIG. 2) that does not include a valid copy of the desired data (Par. [0047], page 12, lines 4-15). The at least one other processor (54, 58 and 60 of FIG. 2) responding to the broadcast request with a response indicating that the at least one other processor (54, 58 and 60 of FIG. 2) does not include a valid copy of the desired data (Par . [0047], page 12, lines 4-15).

R. Claim 22

Claim 22 is directed to the system (50 of FIG. 2) of claim 20, wherein the source processor (56 of FIG. 2), after transitioning to the second state, is capable of silently evicting the desired data by returning to the first state (Par. [0048], page 12, lines 16-22).

S. Claim 23

Claim 23 is directed to the system (50 of FIG. 2) of claim 20, wherein the broadcast request for the desired data comprises a non-ownership request (Par. [0046], page 11, line 32 to page 12, line 3).

T. Claim 24

Claim 24 is directed to the system (50 of FIG. 2) of claim 23, wherein the non-ownership request comprises a source broadcast read request (Par. [0046], page 11, line 32 to page 12, line 3).

U. Claim 25

Claim 25 is directed to the system (50 of FIG. 2) of claim 20, wherein the system (50 of FIG. 2) implements a source broadcast protocol that defines rules for processing broadcast requests provided by processors within the system (50 of FIG. 2) and, if a request fails, the system (50 of FIG. 2) transfers to an associated forward progress directory-based protocol (Par. [0043], page 11, lines 3-15).

V. Claim 26

Still yet another aspect of the invention is directed to a system (10 of FIG. 1, 50 of FIG. 2, 100 of FIG. 3) comprising means for broadcasting, from a first node (12 of FIG. 1, 56 of FIG. 2, 100 of FIG. 3, 150 of FIG. 4, 160 of FIG. 5, 170 of FIG. 6, 190 of FIG. 7, 200 of FIG. 8), a non-ownership request for data (Pars. [0032] page 7, line 17 to page 8, line 2; [0046], page 11, line 32 to page 12, line 3; Pars. [0060], page 17, line 15-27). The system (10 of FIG. 1, 50 of FIG. 2, 100 of FIG. 3) also comprises means for indicating (14 and 20 of FIG. 1; 54, 58 and 60 of FIG. 2; 104 and 106 of FIG. 3; 154 of FIG. 4, 164 of FIG. 5, 176 of FIG. 6, 194 of FIG. 7, 204 of FIG. 8) that at least one other node in the system

(10 of FIG. 1, 50 of FIG. 2, 100 of FIG. 3) has a shared copy of the requested data (Pars. [0032], page 7, line 17 to page 8, line 2; [0047], page 12, lines 4-15; [0059], page 16, line 25 to page 17, line 14; [0063], page 18, lines 11-24; [0064], page 18, line 25 to page 19, line 3; [0065], page 19, lines 4-15; [0067], page 19, line 26 to page 20, line 5; [0068], page 20, lines 6-18; [0069], page 20, lines 19-33). The system (10 of FIG. 1, 50 of FIG. 2, 100 of FIG. 3) further comprises means for providing from memory (16 of FIG. 1, 72 of FIG. 2, 110 of FIG. 3, 156 of FIG. 4, 168 of FIG. 5, 176 of FIG. 6) a copy of the requested data to the means for broadcasting (Pars. [0063], page 18, lines 11-24; [0064], page 18, line 25 to page 19, line 3; [0065], page 19, lines 4-15). The system (10 of FIG. 1, 50 of FIG. 2, 100 of FIG. 3) still further comprises means for enabling the first node (12 of FIG. 1, 56 of FIG. 2, 100 of FIG. 3, 150 of FIG. 4, 160 of FIG. 5, 170 of FIG. 6, 190 of FIG. 7, 200 of FIG. 8) to respond to subsequent non-ownership requests for the data from other nodes (14 and 20 of FIG. 1; 54, 58 and 60 of FIG. 2; 104 and 106 of FIG. 3; 154 of FIG. 4, 164 of FIG. 5, 176 of FIG. 6, 204 of FIG. 8) in the system (10 of FIG. 1, 50 of FIG. 2, 100 of FIG. 3) by providing a shared copy of the data received from memory (16 of FIG. 1, 72 of FIG. 2, 110 of FIG. 3, 156 of FIG. 4, 168 of FIG. 5, 176 of FIG. 6; Pars. [0033], page 8, lines 3-14; [0049], page 12, lines 23-33; [0060], page 17, lines 15-27; [0063], page 18, lines 11-24; [0064], page 18, line 25 to page 19, line 3; [0066], page 19, lines 16-25; [0069], page 20, lines 19-33).

W. Claim 27

Claim 27 is directed to the system (10 of FIG. 1, 50 of FIG. 2, 100 of FIG. 3) of claim 26, wherein the means for enabling (12 of FIG. 1, 56 of FIG. 2, 100 of FIG. 3, 150 of FIG. 4, 160 of FIG. 5, 170 of FIG. 6, 190 of FIG. 7, 200 of FIG. 8) defines an ordering point in the system for responding to non-ownership requests for the data (Pars. [0033], page 8, lines 3-14; [0049], page 12, lines 23-33; [0060], page 17, lines 15-27; [0063], page 18, lines 11-24; [0064], page 18 line 25 to page 19, line 3; [0066], page 19, lines 16-25; [0069], page 20, lines 19-33). The system (10 of FIG. 1, 50 of FIG. 2, 100 of FIG. 3) further comprising means for migrating the ordering point from the first node (12 of FIG. 1, 56 of FIG. 2, 100 of FIG. 3, 150 of FIG. 4, 160 of FIG. 5, 170 of FIG. 6, 190 of FIG. 7, 200 of FIG. 8) to another node (14 and 20 of FIG. 1; 54, 58 and 60 of FIG. 2; 104 and 106 of FIG. 3; 204 of FIG. 8) in the system (10 of FIG. 1, 50 of FIG. 2, 100 of FIG. 3) in response to a non-ownership request for the data provided by the another node (14 and 20 of FIG. 1; 54, 58 and 60 of FIG. 2; 104 and 106 of FIG. 3; 204 of FIG. 8; Pars. [0036], page 8, line 33 to page 9, line 9; [0049], page 12, 23-33; [0060], page 17, lines 15-27; [0069], page 20, lines 19-33).

X. Claim 28

Claim 28 is directed to the system (10 of FIG. 1, 50 of FIG. 2, 100 of FIG. 3) of claim 26, wherein the system (10 of FIG. 1, 50 of FIG. 2, 100 of FIG. 3) employs a source broadcast protocol that defines rules for processing broadcast

requests provided by processors within the system (10 of FIG. 1, 50 of FIG. 2, 100 of FIG. 3; Pars. [0026], page 5, lines 28-33; [0031], page 7, lines 10-16; [0043], page 11, lines 3-15; [0051], page 13, lines 9-14; [0055], page 14, lines 9-17). The system (10 of FIG. 1, 50 of FIG. 2, 100 of FIG. 3) further comprising means for transferring to an associated forward progress directory-based protocol for processing a request if the request fails in the source broadcast protocol (Pars. [0041], page 10, lines 18-29; [0043], page 11, lines 3-15; [0051], page 13, lines 9-14).

Y. Claim 29

Claim 29 is directed the system (10 of FIG. 1, 50 of FIG. 2, 100 of FIG. 3) of claim 26, wherein the memory (16 of FIG. 1, 72 of FIG. 2, 110 of FIG. 3, 156 of FIG. 4, 168 of FIG. 5, 176 of FIG. 6) comprises a home node for the requested data (Pars. [0027], page 6, lines 1-5; [0044], page 11, lines 16-25; [0063], page 18, lines 11-24; [0064], page 18, line 25 to page 19, line 3; [0065], page 19, lines 4-15). The system further comprising means for blocking (184 of FIG. 6) the home node (176 of FIG. 6) from responding with data to another request if the first node (170 of FIG. 6) provides a response to the another request that includes a shared copy of the data (Par. [0067], page 19, line 26 to page 20, line 5).

Z. Claim 30

Still yet an another aspect of the invention is direct to a method comprising broadcasting (300 of FIG. 9) a read request for data from a source node to other nodes of an associated system (Par. [0071], page 21, lines 7-15). The method also comprises transitioning (310 of FIG. 9) the source node into an F-state in response to receiving the data from memory and receiving non-data responses from other target nodes in the system indicating that the data is shared with at least one of the other target nodes (Par. [0071], page 21, lines 7-15). The method further comprises enabling (320 of FIG. 9) the source node, while in the F-state, to serve as an ordering point that is capable of responding to non-ownership requests for the data by providing a shared copy of the data (Par. [0071], page 21, lines 7-15).

AA. Claim 31

Claim 31 is directed to the method of claim 32, further comprising silently evicting the data from the source node (12 of FIG. 1) by modifying the state of the data in the source node (12 of FIG. 1) to an invalid state (Par. [0034], page 8, lines 15-21).

AB. Claim 32

Claim 32 is directed to the method of claim 30, further comprising moving the ordering point for the data from the source node (12 of FIG. 1) to another node (14 and 20 of FIG. 1) in response to a non-ownership request for the data

provided by the another node (14 and 20 of FIG. 1; Par. [0033], page 8, lines 3-14).

AC. Claim 33

The method of claim 30, wherein the associated system (10 of FIG. 1) defines a multiprocessor system that includes a plurality of processor nodes (12 and 14 of FIG. 1), including the source node (12 of FIG. 1) and the other target nodes (14 of FIG. 1; Par. [0031], page 7, lines 10-16). Each of the processor nodes (12 and 14 of FIG. 1) comprising a cache (22 and 24 of FIG.1) that stores data in corresponding cache lines, each cache line having an associated address and state information that defines a state for the data in the corresponding cache line (Par. [0024], page 5, lines 14-20).

AD. Claim 34

Claim 34 is directed to the method of claim 30, further comprising employing a broadcast protocol that defines rules for processing the broadcast read request provided by the source node (12 of FIG. 1; Par. [0039], page 9, line 32 to page 10, line 6) and reissuing the read request employing an associated forward progress if the read request broadcast by the source node (12 of FIG. 1) fails while employing the source broadcast protocol (Par. [0041], page 10, lines 18-29).

AE. Claim 35

Claim 35 is directed to the method of claim 34, wherein the memory (16 of FIG. 1) comprises a home node for the data requested by the source node (12 of FIG. 1; Par. [0041], page 10, lines 18-29). The method comprises sending an instruction (184 of FIG. 6) from the source node (170 of FIG. 6) having the F-state to block the home node (176 of FIG. 6) from responding with data to a subsequent non-ownership request for the data if the source node (170 of FIG. 6) provides a response to the subsequent non-ownership request that includes a shared copy of the data (Par. [0067], page 19, line 26 to page 20, line 5).

VII. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

A. Whether claims 1-6, 8-9 and 13 are made obvious by Cypher in view of Hum.

B Whether claims 7, 10 and 31 are made obvious by Cypher in view of Hum and in further view of Hum 2.

C Whether claims 11, 12, 14-15, 17-30 and 32-34 are made obvious by Cypher in view of Hum and in further view of Arimilli.

D. Whether claims 16 and 22 are made obvious by Cypher in view of Hum, in further view of Arimilli and in further view of Hum 2.

VIII. ARGUMENT

A. 35 U.S.C. §103(a) rejection of claims 1-6, 8-9 and 13 as being made obvious by Cypher in view of Hum

Obviousness requires a suggestion of all limitations in a claim. CFMT, Inc. v. YieldUp Int'l Corp., 349 F.3d 1333, 1342, 68 U.S.P.Q.2D 1940 (Fed. Cir. 2003).

1. The Obviousness Rejection of Claim 1

Cypher taken in view of Hum does not make claim 1 obvious. Claim 1 recites a system that includes a first node that can associate an F-state with a copy of data. In the Final Action, it is contended that numerous sections of Cypher discloses this element of claim 1 (See Final Action, Page 14). Applicant's representative respectfully disagrees. Cypher fails to teach or suggest an F-state when describing systems employing directory based protocols, as identified in the Final Action (See Cypher, Par. [0007]). Instead, the only mention of cache states in Cypher appear to relate to the modified (M), owned (O), shared (S) and invalid (I), corresponding to the well known MOSI protocol (See Cypher, Par. [0052]). The other sections of Cypher relied on in the Final Action do not appear relevant to claim 1. For example, see Cypher at Paragraphs [0007] and [0008], which merely discuss that shared memory multi-processing systems can

employ either a broadcast snooping cache coherency protocol or a directory based cache coherency protocol.

It is argued in the Final Action that since Cypher discloses that when a subsystem that currently owns a block of data observes a coherency request to the block, the owning subsystem typically responds by providing data to the requestor and invaliding its copy, that Cypher also teaches an F-state, as recited in claim 1 (See Final Action, Pages 3-4). To support this contention, the Final Action has cited Table 1 and Paragraph [0034] of the present application's specification. Applicant's representative respectfully submits that the Final Action is attempting to impermissibly use the particular implementation details of the system disclosed in the present application to reject claim 1. Applicant's representative respectfully submits that the present Application (and particularly not Paragraph [0034] of the present application) does not qualify as prior art under 35 U.S.C. §103(a) to support an obviousness rejection of claim 1. The contention that a given reference might teach something that is set forth in the present application, does not necessitate a finding that the reference also teaches or suggests what is being claimed. It is against the claims that a prima facie case of obviousness must be presented. See *In re Rouffet*, 149 F.3d 1350, 47 USPQ2d 1453, 1457 (Fed. Cir. 1998).

Additionally, the Final Action contends that Cypher discloses a first node operative to provide a source broadcast requesting data, the first node

associating an F-state with a copy of the data in response to receiving responses, as recited in claim 1 (See Final Rejection, Page 14, citing Par. [0068] of Cypher). Applicant's representative respectfully disagrees. This cited section of Cypher as well as Cypher, more generally, simply contains no teaching or suggestion that a first node would associate an F-state with a copy of data in response to the conditions recited in claim 1. Specifically, claim 1 recites associating an F-state with a copy of the data in response to both receiving the copy of the data from memory and in response to receiving non-data responses from other nodes in the system. As just mentioned, the first node (that associates the F-state) in claim 1 is also operative to provide a source broadcast request for data, whereas Cypher explicitly discloses a directory based point-to-point response to detection of a cache miss (See Cypher, Par. [0068]).

The Final Action states that Applicant's representative argues that Cypher fails to teach or suggest "a first node operative to provide a source broadcast requesting data" (See Final Action, Page 4). Applicant's representative respectfully submit that such as statement illustrates that the arguments regarding the patentability of claim 1 have been considered separately and not from the interrelationship of the features recited in the system of claim 1. Thus, Applicant's representative respectfully submits that claim 1 has been mischaracterized by the Final Action and reference should be made to the

system of claim 1 in its entirety, as all features must be considered in ascertaining patentability.

The Final Action admits that Cypher fails to teach or suggest an F-state capable of responding to request from the other nodes in the system with a shared copy of the data (See Final Action, Page 15); although Applicant's representative respectfully asserts that claim 1 actually recites that the F-state enables the first node to serve as an ordering point in the system capable of responding to requests from the other nodes in the system with a shared copy of the data. The Final Action relies on Hum to make up for the deficiencies of Cypher. However, neither Hum nor Cypher (as discussed above) teach or suggest associating an F-state with a copy of the data in response to receiving the copy of the data from memory and receiving non-data responses from other nodes in the system, the non-data responses including an indication that at least a second node includes a shared copy of the data, as recited in claim 1.

In contrast to the contentions made in the Final Action, the F-state taught in Hum does not correspond to the F-state claimed in claim 1. Instead, Hum discloses that a node can keep the cache line in a forward state (F-state) when a peer node in an exclusive state (E-state) responds to a port read (PRL) request with data that includes an indication that the data is in the F-state (dataF message) to the peer node for the data and when a home node responds with an acknowledgment (ACK) message to a conflicts (CNCL) message from a node

that previously held the data in the E-state (See Hum, Col. 6, Lines 39-60). That is, in contrast to the F-state recited in claim 1, the F-state disclosed in Hum is not associated with a copy of the data in response to receiving the copy of the data from memory and receiving non-data responses from other nodes in the system. Because of these differences, the F-state in Hum does not correspond to the F-state recited in claim 1. Therefore, even if the teachings of Cypher and Hum were combined, one of ordinary skill in the art would not be motivated to modify the purported combination to create the system of claim 1.

Moreover, Applicant's representative respectfully submits that there is not proper motivation to combine the teachings of Cypher with those of Hum. For instance, Cypher relates to a system that can select either a broadcast protocol or a point-to-point protocol according to mode control logic. The Final Action contends that simply since Hum includes a purported teaching of an F-state (although as discussed above, it does not correspond to the F-state of claim 1), an artisan would have been motivated to implement features from Hum into the system of Cypher. However, since the Final Action appears to mischaracterize the teachings of Hum, any reliance on such teachings should obviate the motivation to combine and modify the teachings of Cypher and Hum.

For the reasons stated above, Cypher and Hum fail to make claim 1 obvious, and the rejection of claim 1 should be withdrawn.

2. The Obviousness Rejection of Claim 2

Claim 2 depends from claim 1 and is not made obvious by Cypher taken in view of Hum for at least the same reasons as claim 1 and for the following reasons. In rejecting claim 2, the Final Action contends that Paragraph [0069] of Cypher discloses the elements of claim 2 (See Final Action, Page 16). Applicant's representative respectfully disagrees. The reference to Cypher at Paragraph [0069] used by the Final Action in the rejection of claim 2 seems to be misplaced as this cited section relates to point-to-point transactions. In particular, claim 2 depends from claim 1, and claim 1 recites a first node that is operative to provide a source **broadcast** requesting data (emphasis added). Thus, the system of claim 2 recites that the non-data responses include an indication that at least a second node includes a shared copy of the data (from claim 1) and that the other nodes in the system do not have a copy of the data requested by the first node.

Cypher fails to teach or suggest a system that includes the non-data responses recited in claim 2. Instead, the sections of Cypher being relied upon disclose a requesting agent 100 that sends a point-to-point, read to own request to the home node 102, then the home node blocks the new transactions, marks the requestor 100 as the sole owner, sends a request to own transaction to the owning slave agent 103, and invalidates all other slave agents 104 which have a shared copy (See Cypher, Par. [0069]). Since the approach being relied upon by

the Final Action is a directory-based protocol, Applicant's representative submits that the employment of such a directory would suggest eliminating the need for responses that indicate that the other nodes do not have a copy because the home node 102 selects node 103 that has a copy and invalidates all other copies (See Cypher, Par. [0069]).

The Final Action appears to mischaracterize selected sections of Cypher out of their actual and intended context (See Final Action, Page 7). Both paragraphs [0008] and [0069] of Cypher relate to point-to-point mode coherence requests - there being no disclosure of a source broadcast requesting data from the first node, in contrast to what is recited in claim 1. Moreover, claim 2 recites characteristics of "the non-data responses," whereas the parts of Cypher explained in the Final Action are clearly themselves commands or requests - NOT responses. Thus, the Final Action's contention has mischaracterized Cypher by omitting or ignoring express teachings of Cypher; namely, that the "home agent sends invalidate coherency demands to all other slave agents with a shared copy" (emphasis added), as disclosed in Cypher (See Cypher, Par. [0069]). That is, in Cypher, the invalidate coherency demands (not responses) are sent to only those slave agents having a shared copy (See Cypher, Par. [0069]). Therefore, Applicant's representative respectfully submits that the teachings of Cypher have not been considered in its entirety. References must be considered in the context of the teaching of the entire

reference. *In re Kotzab*, 217 F.3d 1365, 1371, 55 U.S.P.Q.2D 1313 (Fed. Cir. 2000). For these reasons, Cypher taken in view of Hum fails to make claim 2 obvious. Accordingly, the rejection of claim 2 should be withdrawn.

3. The Obviousness Rejection of Claim 3

Claim 3 depends from claim 1 and is not made obvious by Cypher taken in view of Hum for at least the same reasons as claim 1 and for the following reasons. The Final Action contends that Cypher discloses claim 3 by virtue of Figure 4 and Paragraph [0068]. Applicant's representative respectfully disagrees with this contention. Paragraph [0068] of Cypher refers to the system in Cypher which uses point-to-point transactions, not broadcast transactions. Additionally, in contrast to the contention of the Final Action, Paragraph [0068], lines 1-9, of Cypher discloses a point-to-point (not a broadcast) "read to own" request that is transmitted to the home client 102. In contrast to the teachings of Cypher, claim 3 recites that a source broadcast requesting data comprises a non-ownership request for the data, not a read to own request. Therefore, Cypher taken in view of Hum does not make claim 3 obvious as disclosed in Cypher in para. [0068]. Accordingly, Applicant's representative respectfully requests withdrawal of the rejection of claim 3.

4. The Obviousness Rejection of Claim 4

Claim 4 depends from claims 3 and 1 and is not made obvious by Cypher taken in view of Hum for at least the same reasons as claims 3 and 1 and for the following reasons. In rejecting claim 4, the Final Action cites references in Cypher to point-to-point read to own transactions which fail to teach or suggest the non-ownership broadcast read requests recited in claim 4 (See Final Action, Page 6, citing Cypher at Par. [0068]). Moreover, the general description of protocols described in Cypher used in shared memory multiprocessing systems (See Cypher, Par. [0007]) fails to teach or suggest a non-ownership request comprises a source broadcast read request, as recited in claim 4. Accordingly, Cypher taken in view of Hum fails to teach or suggest each and every element of claim 4.

Additionally, it must be noted that claim recites that the non-ownership request, which is a source broadcast request (from claims 1 and 3), comprises a source broadcast read request. In sharp contrast, paragraph [0068] of Cypher relates specifically to a read to own coherency request (an ownership request, NOT a non-ownership request). Additionally, the protocol being described with respect to the particular transaction in paragraph [0068] of Cypher is a point to point directory based protocol, as do the scenarios described with respect to

Figures 8A, 8B, 8C and 8D of Cypher. Therefore, the divergent approach in Cypher appears to support the patentability of claim 4.

For these reasons, withdrawal of the rejection of claim 4 is respectfully requested.

5. The Obviousness Rejection of Claims 5-6 and 8-9

Claims 5-6 and 8-9 depend either directly or indirectly from claim 1 and are not made obvious for at least the same reasons as claim 1 and for the specific element recited therein. Accordingly, withdrawal of the rejection of claims 5-6 and 8-9 is respectfully requested.

6. The Obviousness Rejection of Claim 13

Claim 13 depends from claim 1 and is not made obvious for at least the same reasons as claim 1 and for the following reasons. In the rejection of claim 13, the Final Action contends that Cypher discloses that the ordering point defined by the F-state migrates from the first node to another node (See Final Action, Page 17). Applicant's representative respectfully disagrees. In particular, as stated above with respect to claim 1, from which claim 13 depends, the Final Action admits that claimed features associated with an F-state are missing from Cypher as applied to claim 1. However, in the rejection of claim 13, it appears that the Final Action is now contending that Cypher does teach features

associated with an F-state. Accordingly, Applicant's representative respectfully submits that inconsistent arguments are being presented with respect to claims 1 and 13.

Applicant's representative respectfully submits that Cypher is silent on associating an F-state with a node in the manner recited in claim 1 to enable the node to operate in the manner recited, let alone the migration of the ordering point defined by the F-state, as recited in claim 13 (See Cypher, Pars. [0075] and [0076]). In contrast to claim 13, Cypher discloses that various ordering points are established within a node and that a client may serve as an ordering point (See Cypher at Par. [0075]). Hum is also deficient relative to the system of claim 13 for at least the same reasons mentioned above with respect to claim 1. For these reasons, Cypher taken in view of Hum fails to make claim 13 obvious. Accordingly, withdrawal of the rejection of claim 13 is respectfully requested.

B. 35 U.S.C. §103(a) Rejection of Claims 7, 10, 31 and 35 as being Made Obvious by Cypher in view of Hum and in further view of Hum 2

1. The Obviousness Rejection of Claim 7

Claim 7 depends from claim 1 and is patentable for at least the same reasons as claim 1. Moreover, the further addition of Hum 2 does not make up for the aforementioned deficiencies of Cypher taken in view of Hum with respect

to claim 1, from which claim 7 depends. In rejecting claim 7, it is contended in the Final Rejection that Paragraph [0065] of Hum 2 discloses the elements recited in claim 7. Applicant's representative respectfully disagrees. Specifically, Hum 2 fails to teach or suggest that a silent eviction could be implemented by a cache controller for data stored in cache lines by modifying state information from an F-state to an invalid state, as recited in claim 7. Instead, Hum 2 merely describes silent eviction of a shared copy (See Hum 2, Par. [0065]). Nothing in Hum 2 teaches or suggests an F-state silent eviction as recited in claim 7.

It is impermissible to use the claimed invention as an instruction manual or "template" to piece together the teachings of the prior art so that the claimed invention is rendered obvious. *In re Fritch*, 972 F.2d 1260, 23 U.S.P.Q.2D 1780 (Fed. Cir. 1992). Applicant's representative respectfully submits that the rejection of claim 13 appears to be clear application of improper hindsight analysis as the neither the Final Action nor any combination of the three references (Cypher, Hum and Hum 2) being applied seem to provide any motivation to create the system of claim 7.

Moreover, Final Action contends that claim 7 does not recite implementing an F-state by a cache controller (See Final Action Page 8). Applicant's representative respectfully submits that such a statement illustrates that claim 7, as well as the arguments in support of the patentability of claim 7, have been misconstrued. Reference to claim 7 in the attached Claims Appendix

demonstrates that claim 7 recites a cache controller that is capable of silently evicting data stored in one of the cache lines by modifying state information from an F-state to an invalid state. Thus, claim 7 recites that the cache controller can silently evict data. Therefore, Applicant's representative respectfully submits that claim 7 has been misconstrued, and thus the Final Action fails to establish a *prima facie* case of obviousness with respect to claim 7.

Therefore, for the reasons discussed above, Cypher, Hum and Hum 2 fail to make claim 7 obvious. Accordingly, withdrawal of the rejection is respectfully requested.

2. <u>The Obviousness Rejection of Claim 10</u>

Claim 10 depends from claim 1 and is patentable for at least the same reasons as claim 1. Moreover, the further addition of Hum 2 does not make up for the aforementioned deficiencies of Cypher taken in view of Hum with respect to claim 1, from which claim 10 depends. In rejecting claim 10, the Final Action incorporates the rationale for the rejection of claim 7 (See Final Action, Page 18). Cypher taken in view of Hum and in further view of Hum 2 fails to teach or suggest that a cache controller comprises a state engine capable of silently evicting data stored in a cache line having an F-state by modifying the state information for the cache line from the F-state to an invalid state for the data, as recited in claim 10. Instead, Hum 2 merely describes silent eviction of a shared

copy (See Hum 2, Par. [0065]). Nothing in Hum 2 teaches or suggests that a cache controller includes a state engine that is capable of an F-state silent eviction as recited in claim 10. Accordingly, Cypher taken in view of Hum and in further view of Hum 2 fails to make claim 10 obvious. Accordingly, the rejection of claim 10 should be withdrawn.

3. The Obviousness Rejection of Claim 31

The Final Action has failed to establish a *prima facie* case of obviousness with respect to claim 31. Claim 31 depends from claim 32 which has been rejected as being made obvious by Cypher in view of Hum and in further view of Arimilli. The Final Action fails to provide any rationale for the combination and modification of the teachings of Cypher, Hum, Arimilli and Hum 2 with respect to claim 31. Instead, in rejecting claim 31 the Final Rejection, merely relies on the rationale for the rejection of claim 7. Accordingly, the rejection of claim 31 should be withdrawn.

C. 35 U.S.C. §103(a) rejection of Claims 11, 12, 14-15 and 32-34 as being unpatentable over Cypher in view of Hum and in further view of Arimilli

1. The Obviousness Rejection of Claim 11

Claim 11 depends from claim 1, and is patentable for at least the same reasons as claim 1. Moreover, the further addition of Arimilli does not make up for the aforementioned deficiencies of Cypher taken in view of Hum with respect to claim 1. The Final Rejection contends that column 6, lines 39-65 of Arimilli discloses the elements of claim 11. Applicant's representative respectfully disagrees. The reliance on Arimilli at column 6, lines 39 to 64, seems to be misplaced as the cited section of Arimilli fails to teach or suggest transferring from a source broadcast protocol to an associated forward progress protocol in response to a request failing in the source broadcast protocol, as recited in claim 11. Instead, the cited section of Arimilli discloses moving a coherency state of a requested cache item toward an expected coherency state at the completion of the original operation (See Arimilli, Col. 6, Lines 39 to 45).

Page 10 of the Final Action further appears to impermissibly rely on information set forth in the present application as a basis for rejecting claim 11. First the Examiner refers to paragraphs [0006]-[0007], which are in the Background of the application. Neither of these paragraphs discloses what is

recited in claim 11, but instead simply mentions two different types of protocols. Applicant further submits that such reliance on what is recited in a given paragraph does not present a prima facie case of obviousness for a given claim. *In re Roufett*, supra. That a claim or features of claim may have support in the specification does not remedy the fact that Arimilli fails to teach or suggest that the system can transfer to a forward progress protocol. Perhaps the differences between claim 11 and the teachings of Arimilli may be better understood with reference to the following chart that provides a side-by-side comparison.

Arimilli Col. 6, lines 39-45:	Claim 11:
In general terms, the mechanism of the present invention for making forward progress on retried snoop hits involves undertaking an action, in response to detecting an operation on the system bus which was the subject of a previous failed intervention, which moves the coherency state of a requested cache item toward the expected coherency state at the completion of the original operation.	The system of claim 1, wherein the system implements a source broadcast protocol to process requests and responses provided by nodes within the system, the system transferring to an associated forward progress protocol in response to a request failing in the source broadcast protocol.

The above comparison clearly demonstrates the deficiencies of Arimilli, col. 6, lines 39-45, relative to claim 11. The Final Action appears not to appreciate the significance that the mechanism is for making progress on "retried snoop hits" and that the mechanism involves undertaking an action "in response to detecting an operation on the system bus which was the subject of a previous

failed intervention." An understanding of these phrases in conjunction with the teachings of Arimilli can better be gleaned from the Summary at col. 3, lines 5-35. This section demonstrates that different action can be taken to make forward progress when one or more failed interventions are detected. However, the forward progress does not correspond to transferring the system to a forward progress protocol in response to a request failing in the source broadcast protocol, but instead forces a state change for the requested cache item to obviate the need for subsequent interventions (Arimilli, col. 6, lines 45-50).

In the Final Action, it is further argued that since Cypher discloses a mechanism for making forward progress on retired snoop hits involves undertaking an action, in response to detection on a system bus which was subject to a previous failed intervention, which moves a coherency state of a requested cache item toward an expected coherency state at the completion of an original operation that Cypher discloses claim 1 (See Final Action, Page 10, Citing Col. 6, Lines 39-45 of Arimilli). Applicant's representative respectfully submits that changing a cache state (as disclosed in Arimilli) does not correspond to transferring from a source broadcast protocol to a forward progress protocol in response to a request failing in the source broad protocol, as recited in claim 11.

For these reasons, Cypher taken in view of Hum and in further view of Arimilli does not make claim 11 obvious. Thus, withdrawal of the rejection of claim 11 is respectfully requested.

2. The Obviousness Rejection of Claim 12

Claim 12 depends from claim 11 and is not made obvious for at least the same reasons as claim 11 and for the specific elements recited therein. Accordingly, withdrawal of the rejection of claim 12 is respectfully requested.

3. The Obviousness Rejection of Claim 14

Cypher taken in view of Hum and in further view of Arimilli does not make claim 14 obvious. Cypher taken in view of Hum and in further view of Arimilli fails to teach or suggest that a second node becomes an ordering point in a network in response to receiving a shared copy of the data, as recited in claim 14, since Cypher, Hum and Arimilli fail to teach or suggest that ordering points can even migrate.

Moreover, in rejecting claim 14, the Final Action contends that Arimilli discloses the interrelationships between responses, requests and states that occur in the network of claim 14, including a teaching that the second node becomes an ordering point in the network (See Final Action Page 20 citing Arimilli at col. 5, line 60, to col. 6, line 15). Applicant's representative respectfully

disagrees. The cited section of Arimilli discloses a push operation that results in forcing a state change of data and involves pushing the data to system memory. In contrast, in claim 14, data is transferred between nodes and the second node transitions to a third state in response to receiving the shared copy of data from the first node, such that the second node becomes an ordering point in the network for providing a shared copy of the data. Since the combined teachings of Cypher and Hum with Arimilli collectively fail to provide a teaching or suggestion regarding what is recited in claim 14, one of ordinary skill in the art would not be motivated to create the system of claim 14 based on such teachings. Accordingly, Applicant's representative respectfully requests withdrawal of the rejection of claim 14.

4. The Obviousness Rejection of Claims 15 and 17-18

Claims 15 and 17-18 depend either directly or indirectly from claim 14 and are not made obvious for at least the same reasons as claim 14 and for the specific elements recited therein. Accordingly, withdrawal of the rejection of claims 15 and 17-18 is respectfully requested.

5. The Obviousness Rejection of Claim 19

Claim 19 depends from claim 14 and is not made obvious for at least the same reasons as claim 14 and for the following reasons. Claim 19 recites that a

third state and a second state are the same. The Final Action contends that Arimilli discloses the elements of claim 19 (See Final Rejection, Page 14, citing Col. 3, Lines 17-25 of Arimilli). Applicant's representative respectfully disagrees. The cited section of Arimilli describes data from a modified state pushing data to system memory or if in a different state, changing its state to shared or invalid (See Arimilli, Col. 3, Lines 17-25). Arimilli simply contains no disclosure or suggestion to states that might correspond to the first, second and third states recited in claim 19. Instead, the particular states disclosed in Arimilli correspond to different possible states (Col. 3, Lines 17-25 of Arimilli).

Additionally, claim 14, from which claim 19 depends, recites that a first state indicates that the data is shared with memory (not a modified state) and that the first state causes the first node to respond to a non-ownership request from the second node. As discussed above with respect to claim 14, Cypher taken in view of Hum and in further view of Arimilli fails to teach or suggest this feature of claim 14. Consequently, Cypher taken in view of Hum and in further view of Arimilli cannot teach or suggest the network of claim 14 wherein the third state and the second state are the same, as recited in claim 19. Therefore, Cypher taken in view of Hum and in further view of Arimilli does not make claim 19 obvious. Accordingly, withdrawal of the rejection of claim 19 is respectfully requested.

6. The Obviousness Rejection of Claim 20

Cypher taken in view of Hum and in further view of Arimilli does not make claim 20 obvious. In rejecting claim 20, the Final Action relies on the same rationale presented in the rejection of claims 1 and 14 (See Final Action Page 21). In rejecting claims 1 and 14, the Final Action cites Paragraphs [0007], [0008], [0068] of Cypher. However, as discussed above with respect to claims 1 and 14, the general description of broadcast based protocols (See Cypher, Par. [0007]), directory based protocols (See Cypher, Par. [0008]), and the general description of directory based point-to-point transactions of FIG. 8A (See Cypher, Par. [0068]) fail to teach or suggest the system of claim 20.

In particular, the citation to the system of Paragraph [0068] of Cypher seems misplaced as it refers only to a point-to-point transaction and not a broadcast request for desired data, as recited in claim 20 (See Cypher, Par. [0068], which falls under the introduction at Paragraphs [0063]-[0064]). Additionally, in the system of Fig 8A of Cypher, the source agent 100 receives the data from the home node 102 and no other messages (See Cypher at Par. [0068] and FIG. 8A). In contrast to the teachings of Cypher, claim 20 recites that a source processor transitions from the first state to a second state in response to receiving responses from the memory and the at least one target processor. No such state transition is taught in Cypher at Par. [0068].

Moreover, the addition of Hum fails to make up for the deficiencies of Cypher in teaching or suggesting claim 20. For example, Hum discloses the use of a Forward state (F-state) for cache coherency in a multi-node system (See Hum Col. 3, Lines 5-6). Hum also describes the F-state as a "first among equals" notion in the context where there exists a valid copy of requested data in memory and further teaches that the owned copy of data may be eliminated (See Hum, Col. 5, Lines 3-5). However, Hum fails to teach or suggest a source processor transitioning from the first state to a second state in response to receiving a response from memory and at least one target processor, the second state enabling the first processor to respond to requests from the plurality of processors with a copy of the desired data, as recited in claim 20. Since the F-state described in Hum does not occur in response to the conditions recited in claim 20, the F-state described in Hum does not correspond to the F-state of claim 20.

Furthermore, Arimilli also fails to make up for the previously stated deficiencies of Cypher and Hum relative to claim 20. For example, Arimilli fails to teach or suggest that the source processor transitions from the first state to a second state in response to receiving the responses from memory and the at least one target processor, as recited in claim 20. Instead, Arimilli discloses that the push operation allows other devices (not the source device) within the system which have the requested cache item in the hovering state to update the data

associated with the address tag for the requested cache item, such that the requested cache item transitions to a shared state in the local memory (See Arimilli, Col. 5 Lines 60-67). The approach in this section of Arimilli thus includes no basis from one of ordinary skill in the art would be able to configure a system with processors and memory that would be capable of responding to broadcast requests and in which a source processor would implements state transitions in response to the conditions recited in claim 20.

For at least these reasons, Cypher taken in view of Hum and in further view of Arimilli, fail to render the system recited in claim 20 obvious. Accordingly, Applicant's representative respectfully requests that the rejection of claim 20 be withdrawn.

7. The Obviousness Rejection of Claim 21

Claim 21 depends from claim 20. Accordingly, claim 21 is not made obvious by Cypher taken in view of Hum and in further view of Arimilli for at least the same reasons as claim 20 and for the following reasons. The Final Action contends that the system of FIG. 8 in Paragraph [0069] of Cypher discloses the elements of claim 21 (See Final Action, Page 22). Applicant's representative respectfully disagrees. The reliance on Cypher seems misplaced as Cypher describes a non-broadcast point-to-point (PTP) transaction between a home node 102, source node 100, slave agent 103, and other slave agents 104 (See

Cypher, Par. [0069]). The operation of this system is in sharp contrast to claim 21. Specifically, in Cypher, none of the other nodes (102, 103 or 104) responds to the broadcast request with a response indicating that the at least one other processor does not include a valid copy of the desired data, as recited in claim 21. In marked contrast, in the system of Cypher, the requesting agent (source node) 100 sends a PTP read to own (RTO) request to the home node, then the home node sends a RTO to the current owner node 103 (See Cypher, Par. [0069]). This sequence of requests and responses, however, includes no mention of other processor responses consistent with claim 21. This again appears to be based at least in part to the particular directory based point to point protocol being implemented in Cypher.

In the Final Action, it is also argued that since Cypher discloses that a home agent marks a requestor as a sole owner of a line and sends an RTO demand to an owning slave agent, that the home agent also sends invalidate coherency demands to all other salve agents with a shared copy, and that the owning slave agent replies with data to a requesting agent and invalidates its copy, that Cypher discloses claim 21 (See Final Rejection, Page 13, citing Par. [0069] of Cypher). Applicant's representative respectfully submits that the cited sections of Cypher is devoid of any teaching or suggestion that a processor responds to a broadcast request with a response indicating that at least one other processor does not include a valid copy of the desired data, as recited in

claim 21 (emphasis added). Accordingly, Cypher taken in view of Hum and in further view of Arimilli does not make claim 21 obvious. Thus, withdrawal of the rejection of claim 21 is respectfully requested.

8. The Obviousness Rejection of Claim 22

Claim 22 depends from claim 20 and is not made obvious for at least the same reasons as claim 20, and for the following reasons. In rejecting claim 22, the Final Action provides no reason that Cypher taken in view of Hum and in further view of Arimilli makes claim 22 obvious. In fact, claim 22 is rejected as being made obvious by Cypher in view of Hum, in further view of Arimilli and in further view of Hum 2 for the same reasons as claim 16, which are the same reasons claim 10 was rejected (See Final Rejection, Page 23). Accordingly, it appears that this rejection of claim 22 (based on Cypher, Hum and Arimilli) was made in error and should be withdrawn.

9. The Obviousness Rejection of Claim 23

Claim 23 depends from claim 20 and is not made obvious for at least the same reasons as claim 20 and for the following reasons. In rejecting claim 23, the Final Action incorporates the rationale for the rejection of claim 3 (See Final Action, Page 22). Claim 23 recites that a non-ownership request comprises a source broadcast read request. Paragraph [0068] of Cypher (cited in the

rejection of claim 3) refers to the system in Cypher which uses point-to-point transactions, not broadcast transactions, such as recited in claim 23. Additionally, Cypher discloses a point-to-point (not a broadcast) "read to own" request. In contrast to the teachings of Cypher, claim 23 recites that a source broadcast request for desired data comprises a non-ownership request, not a read to own request (i.e., an ownership type of request) as taught in Cypher. Accordingly, claim 23 is not made obvious by Cypher taken in view of Hum and in further view of Arimilli. Accordingly, withdrawal of the rejection of claim 23 is respectfully requested.

10. <u>The Obviousness Rejection of Claim 24</u>

Claim 24 depends from claims 23 and 20 and is not made obvious for at least the same reasons as claims 23 and 20 and for the following reasons. In rejecting claim 24, the Final Action incorporates the rationale for the rejection of claim 4 (See Final Rejection, Page 22). Claim 24 recites that a non-ownership request comprises a source broadcast request. In rejecting claim 4, the Final Action cites references to point-to-point read to own transactions (See Final Action, Page 6, citing Cypher at Par. [0068]). The point-to-point read to own transactions disclosed in Cypher fails to teach or suggest the non-ownership source broadcast read requests recited in claim 24. Accordingly, Cypher taken in view of Hum and in further view of Arimilli fails to make claim 24 obvious. Thus,

Applicant's representative respectfully requests withdrawal of the rejection of claim 24.

11. The Obviousness Rejection of Claim 25

Claim 25 depends from claim 20 and is not made obvious for at least the same reasons as claim 20 and for the following reasons. In rejecting claim 25, the Final Action relies on the rationale for the rejection of claim 11. Cypher taken in view of Hum and in further view of Arimilli fails to teach or suggest a system that implements a source broadcast protocol that defines rules for processing broadcast requests provided by processors within the system and, if a request fails, the system transfers to an associated forward progress directory-based protocol, as recited in claim 25. The section of Arimilli cited in the rejection of claim 11 (which is incorporated into the rejection of claim 25) discloses moving a coherency state of a requested cache item toward an expected coherency state at the completion of the original operation (See Arimilli, Col. 6, Lines 39 to 45). The cited section of Arimilli is devoid of anything that could be construed as the transferring from a source broadcast protocol to a forward progress directory-based protocol, as recited in claim 25. Accordingly, for these reasons and those discussed above in support of claim 11, Cypher taken in view of Hum and in further view of Arimilli fails to make claim 25 obvious. Thus, withdrawal of the rejection of claim 25 is respectfully requested.

12. The Obviousness Rejection of Claim 26

Cypher taken in view of Hum and in further view of Arimilli does not make claim 26 obvious. In rejecting claim 26, the Final Action relies on the rejection of claim 20 (See Final Action, Page 23), which in turn relies on the rejection of claims 1 and 14 (See Final Rejection, Page 21). The citation to Paragraph [0068] of Cypher (in the rejection of claims 1 and 14) seems misplaced as it refers to a point-to-point transaction and not to means for broadcasting from a first node a non-ownership request for data, as recited in claim 26. Additionally, in the system of Fig 8A of Cypher, the source agent 100 receives the data from the home node 102 and no other messages (See Cypher, Par. [0068] and FIG. 8A). In contrast to the teachings of Cypher, claim 26 recites means for enabling a first node to respond to subsequent non-ownership requests for data from other nodes in the system by providing a shared copy of data received from memory.

Moreover, the addition of Hum fails to make up for the deficiencies of Cypher with respect to claim 26. For example, Hum discloses the use of a Forward state (F-state) for cache coherency in a multi-node system (See Hum Col. 3, Lines 5-6). Hum also describes the F-state as a "first among equals" notion in the context where there exists a valid copy of requested data in memory and further teaches that the owned copy of data may be eliminated (See Hum,

Col. 5, Lines 3-5). However, Hum fails to teach or suggest means for enabling a first node to respond to subsequent non-ownership requests for data from other nodes in the system by providing a shared copy of data received from memory, as recited in claim 26. The approach described in Hum does not transition into its F-state in response to the conditions recited in claim 26.

Furthermore, Arimilli also fails to make up for the previously stated deficiencies of Cypher and Hum relative to claim 26. For example, Arimilli also fails to teach or suggest means for enabling a first node to respond to subsequent non-ownership requests for data from other nodes in the system by providing a shared copy of data received from memory, as recited in claim 26. Instead, Arimilli teaches that the push operation allows other devices (not the source device - the means for broadcasting in claim 26) within the system which have the requested cache item in the hovering state to update the data associated with the address tag for the requested cache item, such that the requested cache item transitions to a shared state in the local memory (See Arimilli, Col. 5, Lines 60-67). For at least these reasons, Cypher taken in view of Hum and in further view of Arimilli, fail to make the system recited in claim 26 obvious. Accordingly, Applicant's representative respectfully requests that the rejection of claim 26 be withdrawn.

13. The Obviousness Rejection of Claim 27

Claim 27 depends from claim 26 and is not made obvious for at least the same reasons as claim 26, and for the specific elements recited therein. Accordingly, Applicant's representative respectfully requests withdrawal of the rejection of claim 27.

14. The Obviousness Rejection of Claim 28

Claim 28 depends from claim 26 and is not made obvious for at least the same reasons as claim 26 and for the following reasons. In rejecting claim 28, the Final Action relies on the rationale provided in the rejection of claim 11 (See Final Action, Page 22). In rejecting claim 11, the Final Action relies on column 6, lines 39-64 of Arimilli. However, Applicant's representative respectfully submits that the reliance on the cited section of Arimilli seems to be misplaced. Specifically, Arimilli fails to teach or suggest that the system employs source broadcast protocol in combination with the means for transferring to an associated forward progress directory-based protocol for processing a request if the request fails in a source broadcast protocol, as recited in claim 28.

Instead, the cited section of Arimilli discloses moving a coherency state of a requested cache item toward an expected coherency state at the completion of the original operation (See Arimilli, Col. 6, Lines 39-45). However, , as discussed above with respect to claim 11, Arimilli fails to teach or suggest that the disclosed

change of coherency state involves a transfer to a forward progress protocol, as recited in claim 28. Accordingly, Cypher taken in view of Hum and in further view of Arimilli does not make claim 28 obvious. Thus, withdrawal of the rejection of claim 28 is respectfully requested.

15. The Obviousness Rejection of Claim 29

Claim 29 depends from claim 26 and is not made obvious for at least the same reasons as claim 26 and for the following reasons. The Final Action contends that FIG. 4 and Paragraph [0068] of Cypher discloses claim 29. Applicant's representative respectfully disagrees. Cypher fails to teach or suggest a home node for the requested data, and means for blocking the home node from responding with the data to another request, as recited in claim 29. Instead, the cited section of Cypher discloses a request agent that upon detecting a cache miss, transmits a read to own coherency request to the home client 102 that may supply the requested data directly to the requesting client (See Cypher, Par. [0068]). There is nothing in the cited section of Cypher that could be construed as the means for blocking recited in claim 29. Additionally, as discussed in support of claim 26, Cypher at Par. [0068] operates according to directory based protocol, such that there would be no basis to employ the means for broadcasting (from claim 26) in combination with the additional means for blocking recited in claim 29. Therefore, Cypher taken in view of Hum and in

further view of Arimilli fails to make claim 29 obvious. Accordingly, Applicant's representative respectfully requests that the rejection of claim 29 be withdrawn.

16. The Obviousness Rejection of Claim 30

In rejecting claim 30, the Final Action relies on the rejection of claim 26 (See Final Action, Page 23), which relies on the rejection of claim 20 (See Final Action, Page 22), which in turn relies on the rejection of claims 1 and 14 (See Final Rejection, Page 21). The citation to Paragraph [0068] of Cypher (in the rejection of claims 1 and 14) seems misplaced as it refers to a point-to-point transaction and not broadcasting a read request for data from a source node to other nodes of an associated system, as recited in claim 30. Additionally, in Paragraph [0068] of Cypher, the source agent 100 receives the data from the home node 102 and no other messages (See Cypher, Par. [0068] and FIG. 8A). In contrast to the teachings of Cypher, claim 30 recites a method that includes *inter alia* enabling a source node, while in an F-state, to serve as an ordering point that is capable of responding to non-ownership requests for data by providing a shared copy of the data.

Moreover, the addition of Hum fails to make up for the deficiencies of Cypher in teaching or suggesting claim 30. For example, Hum discloses the use of a Forward state (F-state) for cache coherency in a multi-node system (See Hum Col. 3, Lines 5-6). Hum also describes the F-state as a "first among

equals" notion in the context where there exists a valid copy of requested data in memory and further teaches that the owned copy of data may be eliminated (See Hum, Col. 5, Lines 3-5). However, Hum fails to teach or suggest enabling a source node, while in an F-state, to serve as an ordering point that is capable of responding to non-ownership requests for data by providing a shared copy of the data, as recited in claim 30. Additionally, as discussed above with respect to claim 1, neither Cypher nor Hum provide support to enable one of ordinary skill in the art to provide for the transition to the F-state in response to the conditions recited in claim 30.

Furthermore, Arimilli fails to make up for the previously stated deficiencies of Cypher and Hum relative to claim 30. For example, Arimilli also fails to teach or suggest enabling a source node, while in an F-state, to serve as an ordering point that is capable of responding to non-ownership requests for data by providing a shared copy of the data, as recited in claim 30. Instead, Arimilli teaches that the push operation allows other devices (not the source device) within the system which have the requested cache item in the hovering state to update the data associated with the address tag for the requested cache item, such that the requested cache item transitions to a shared state in the local memory (See Arimilli, Col. 5, Lines 60-67).

For at least these reasons, Cypher taken in view of Hum and in further view of Arimilli, fail to make the method recited in claim 30 obvious. Accordingly,

Applicant's representative respectfully requests that the rejection of claim 30 be withdrawn.

17. The Obviousness Rejection of Claim 32

Claim 32 depends from claim 30 and is not made obvious for at least the same reasons as claim 30 and for the following reasons. In rejecting claim 32, the Final Action contends that Paragraphs [0075]-[0076] of Cypher discloses claim 32. Applicant's representative respectfully disagrees. None of the prior art references (including the cited section of Cypher) teach or suggest that ordering points move. Therefore, Cypher taken in view of Hum and in further view of Arimilli fails to teach or suggest moving an ordering point for data from a source node to another node in response to a non-ownership request for data provided by another node. Thus, Cypher taken in view of Hum and in further view of Arimilli fails to make claim 32 obvious. Accordingly, Applicant's representative respectfully requests that the rejection of claim 32 be withdrawn.

18. The Obviousness Rejection of Claim 33

Claim 33 depends from claim 30 and is not made obvious for at least the same reasons as claim 30, and for the specific elements recited therein. Accordingly, withdrawal of the rejection of claim 33 is respectfully requested.

19. The Obviousness Rejection of Claim 34

Claim 34 depends from claim 30 and is not made obvious for at least the same reasons as claim 30 and for the following reasons. In rejecting claim 34, the Final Action relies on the rationale provided in the rejection of claim 11 (See Final Action, Page 23). In rejecting claim 11, the Final Action relies on column 6, lines 39-64 of Arimilli (See Final Action, Page 19). However, Applicant's representative respectfully submits that the reliance on the cited section of Arimilli seems to be misplaced as the cited section fails to teach or suggest reissuing a read request employing an associated forward progress if a read request broadcast by a source node fails while employing a source broadcast protocol, as recited in claim 34.

Instead, the cited section of Arimilli discloses moving a coherency state of a requested cache item toward an expected coherency state at the completion of the original operation (See Arimilli, Col. 6, Lines 39-45). However, Arimilli fails to teach or suggest that the disclosed change of coherency state involves a transfer to a forward progress, as recited in claim 34. Similar to as discussed with respect to claim 11, the mechanism for forward progress disclosed in Arimilli does not correspond to the transfer to a forward progress protocol recited in claim 34. Accordingly, Cypher taken in view of Hum and in further view of Arimilli does not make claim 34 obvious. Therefore, withdrawal of the rejection of claim 34 is respectfully requested.

D. 35 U.S.C. §103(a) rejection of Claims 16 and 22 as being unpatentable over Cypher in view of Hum, in further view of Arimilli and in further view of Hum 2

Claims 16 and 22 depend either directly or indirectly from claims 14 and 20, respectively. Accordingly, claims 16 and 22 are patentable for at least the same reasons as claims 14 and 20. Moreover, the further addition of Hum 2 does not make up for the aforementioned deficiencies of Cypher taken in view of Hum and in further view of Arimilli, with respect to claims 14 and 20.

Furthermore, in rejecting claims 16 and 22, the Final Rejection relies on the rejection of claim 10 (See Final Action, Page 23) In rejecting claim 10, the Final Action incorporates the rationale for the rejection of claim 7 (See Final Action, Page 18). Cypher taken in view of Hum and in further view of Arimilli, and in further view of Hum 2 fails to teach or suggest a cache line in one of a first and second states being capable of silently evicting associated data by modifying state information for the cache line to an invalid state, as recited in claim 16 or that a source processor, after transitioning to a second state is capable of silently evicting desired data by returning to a first state, as recited in claim 22. Instead, Hum 2 merely describes silent eviction of a shared copy (See Hum 2, Par. [0065]). Nothing in Hum 2 teaches or suggests an F-state silent eviction, such as recited in claims 16 and 22.

Additionally, Applicant's representative respectfully submits that the Final Action fails to establish a *prima facie* case of obviousness for claims 16 and 22. In rejecting claims 16 and 22, the Final Action fails to give any reason that one of ordinary skill in the art would combine and modify the teachings of Cypher, Hum, Arimilli and Hum 2 to make the system recited in claims 16 and 22. Accordingly, Cypher taken in view of Hum, in further view of Arimilli and in further view of Hum 2 fails to make claims 16 and 22 obvious. Thus, withdrawal of the rejection of claims 16 and 22 is respectfully requested.

IX. APPENDICES

The first attached Appendix contains a copy of the claims on appeal.

The second and third Appendices have been included to comply with statutory requirements.

No additional fees should be due for this Brief. In the event any fees are due in connection with the filing of this document, the Commissioner is authorized to charge those fees to Deposit Account No. 08-2025.

Respectfully submitted,

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I hereby certify that this correspondence is being transmitted to the U.S. Patent and Trademark Office via electronic filing on March 18, 2008.

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Claims Appendix

Claim 1 (Finally Rejected) A system comprising:

a first node operative to provide a source broadcast requesting data, the first node associating an F-state with a copy of the data in response to receiving the copy of the data from memory and receiving non-data responses from other nodes in the system, the non-data responses including an indication that at least a second node includes a shared copy of the data, the F-state enabling the first node to serve as an ordering point in the system capable of responding to requests from the other nodes in the system with a shared copy of the data.

Claim 2 (Finally Rejected) The system of claim 1, wherein the non-data responses further comprise an indication that the other nodes in the system do not have a copy of the data requested by the first node.

Claim 3 (Finally Rejected) The system of claim 1, wherein the source broadcast requesting the data comprises a non-ownership request for the data.

Claim 4 (Finally Rejected) The system of claim 3, wherein the non-ownership request comprises a source broadcast read request.

Claim 5 (Finally Rejected) The system of claim 1, wherein the first node comprises a first processor having an associated cache that comprises plurality of cache lines, one of the cache lines having an address associated with the copy of data received from memory and state data that defines the state of the data stored in the one of the cache lines.

Claim 6 (Finally Rejected) The system of claim 5, wherein the first processor further comprises a cache controller that controls the state of the data stored in the plurality of cache lines.

Claim 7 (Finally Rejected) The system of claim 6, wherein the cache controller is capable of silently evicting the data stored in the one of the cache lines by modifying the state information from the F-state to an invalid state for the data.

Claim 8 (Finally Rejected) The system of claim 1, wherein each node defines a processor having an associated cache that comprises a plurality of cache lines, each cache line having a respective address that identifies associated data and state information that indicates a state of the associated data for the respective cache line, each of the processors being capable of communicating with each other via an interconnect.

Claim 9 (Finally Rejected) The system of claim 8, further comprising a cache controller associated with each cache for managing data requests and responses for the respective cache.

Claim 10 (Finally Rejected) The system of claim 9, wherein the cache controller further comprises a state engine capable of silently evicting data stored in a cache line having the F-state by modifying the state information for the cache line from the F-state to an invalid state for the data.

Claim 11. (Finally Rejected) The system of claim 1, wherein the system implements a source broadcast protocol to process requests and responses provided by nodes within the system, the system transferring to an associated forward progress protocol in response to a request failing in the source broadcast protocol.

Claim 12 (Finally Rejected) The system of claim 11, wherein the forward progress protocol comprises a directory-based protocol.

Claim 13 (Finally Rejected) The system of claim 1, wherein the ordering point defined by the F-state migrates from the first node to another node in

response to the another node issuing a source broadcast non-ownership request for a copy of the data.

Claim 14 (Finally Rejected) A multiprocessor network comprising:

a plurality of processor nodes in communication with each other;

at least a first node of the plurality of processor nodes includes a copy of data associated with a given address that is also shared with memory, the first node operating in a first state that causes the first node to respond to a non-ownership request from a second node of the plurality of processor nodes for the data by (i) sending a response to the second node that includes a shared copy of the data, and (ii) transitioning from the first state to a second state indicating that the data is shared; and

the second node transitioning to a third state in response to receiving the shared copy of the data from the first node, such that the second node becomes an ordering point in the network for providing a shared copy of the data.

Claim 15 (Finally Rejected) The network of claim 14, wherein each of the plurality of processor nodes further comprises an associated cache that comprises a plurality of cache lines, each cache line having a respective address that identifies associated data and state information that indicates the state of the associated data for the respective cache line.

Claim 16 (Finally Rejected) The network of claim 15, wherein a cache line in one of the first and second states being capable of silently evicting associated data by modifying the state information for the cache line to an invalid state.

Claim 17 (Finally Rejected) The network of claim 14, wherein the network implements a source broadcast protocol to process requests provided by nodes within the network and, if a request fails, the requests are reissued by the nodes using an associated forward progress protocol.

Claim 18 (Finally Rejected) The network of claim 17, wherein the forward progress protocol comprises a directory-based protocol.

Claim 19 (Finally Rejected) The network of claim 14, wherein the third state and the second state are the same.

Claim 20 (Finally Rejected) A computer system, comprising:

a plurality of processors comprising:

a source processor that issues a broadcast request for desired data while in a first state; and

at least one target processor having an associated cache that includes a shared copy of the desired data, the at least one target processor responding to

the broadcast request with a response indicating that the at least one target processor includes the shared copy of the desired data;

memory storing the desired data, the memory responding to the broadcast request with a response that includes a copy of the desired data; and

the source processor transitioning from the first state to a second state in response to receiving the responses from the memory and the at least one target processor, the second state enabling the first processor to respond to requests from other of the plurality of processors with a copy of the desired data.

Claim 21 (Finally Rejected) The system of claim 20, further comprising at least one other processor having an associated cache that does not include a valid copy of the desired data, the at least one other processor responding to the broadcast request with a response indicating that the at least one other processor does not include a valid copy of the desired data.

Claim 22 (Finally Rejected) The system of claim 20, wherein the source processor, after transitioning to the second state, is capable of silently evicting the desired data by returning to the first state.

Claim 23 (Finally Rejected) The system of claim 20, wherein the broadcast request for the desired data comprises a non-ownership request.

Claim 24 (Finally Rejected) The system of claim 23, wherein the non-ownership request comprises a source broadcast read request.

Claim 25 (Finally Rejected) The system of claim 20, wherein the system implements a source broadcast protocol that defines rules for processing broadcast requests provided by processors within the system and, if a request fails, the system transfers to an associated forward progress directory-based protocol.

Claim 26 (Finally Rejected) A system, comprising:

means for broadcasting from a first node a non-ownership request for data;

means for indicating that at least one other node in the system has a shared copy of the requested data;

means for providing from memory a copy of the requested data to the means for broadcasting; and

means for enabling the first node to respond to subsequent non-ownership requests for the data from other nodes in the system by providing a shared copy of the data received from memory.

Claim 27 (Finally Rejected) The system of claim 26, wherein the means for enabling defines an ordering point in the system for responding to non-ownership requests for the data, the system further comprising means for migrating the ordering point from the first node to another node in the system in response to a non-ownership request for the data provided by the another node.

Claim 28 (Finally Rejected) The system of claim 26, wherein the system employs a source broadcast protocol that defines rules for processing broadcast requests provided by processors within the system, the system further comprising means for transferring to an associated forward progress directory-based protocol for processing a request if the request fails in the source broadcast protocol.

Claim 29 (Finally Rejected) The system of claim 26, wherein the memory comprises a home node for the requested data, the system further comprising means for blocking the home node from responding with data to another request if the first node provides a response to the another request that includes a shared copy of the data.

Claim 30 (Finally Rejected) A method comprising:

broadcasting a read request for data from a source node to other nodes of an associated system;

transitioning the source node into an F-state in response to receiving the data from memory and receiving non-data responses from other target nodes in the system indicating that the data is shared with at least one of the other target nodes; and

enabling the source node, while in the F-state, to serve as an ordering point that is capable of responding to non-ownership requests for the data by providing a shared copy of the data.

Claim 31 (Finally Rejected) The method of claim 32, further comprising silently evicting the data from the source node by modifying the state of the data in the source node to an invalid state.

Claim 32 (Finally Rejected) The method of claim 30, further comprising moving the ordering point for the data from the source node to another node in response to a non-ownership request for the data provided by the another node.

Claim 33(Finally Rejected) The method of claim 30, wherein the associated system defines a multiprocessor system that includes a plurality of

processor nodes, including the source node and the other target nodes, each of the processor nodes comprising a cache that stores data in corresponding cache lines, each cache line having an associated address and state information that defines a state for the data in the corresponding cache line.

Claim 34 (Finally Rejected) The method of claim 30, further comprising:

employing a broadcast protocol that defines rules for processing the broadcast read request provided by the source node; and

reissuing the read request employing an associated forward progress if the read request broadcast by the source node fails while employing the source broadcast protocol.

Claim 35 (Finally rejected, but objected to) The method of claim 34, wherein the memory comprises a home node for the data requested by the source node, the method further comprising:

sending an instruction from the source node having the F-state to block the home node from responding with data to a subsequent non-ownership request for the data if the source node provides a response to the subsequent non-ownership request that includes a shared copy of the data.

Evidence Appendix

None

Related Proceedings Appendix

None